

**ABSTRACT**

A liquid crystal device comprises a first and second cell wall structure; at least one liquid crystal material disposed within a space between the first and second cell wall structures; and polymer micro-structures, wherein the micro-structures are formed by polymerizing a prepolymer, and wherein said micro-structures have a shape and spatial location determined by said liquid crystal material. Permanent polymer micro-structures are formed from a liquid crystal with a non-uniform spatially modulated director field. The polymer structures have the shape and spatial location dictated by the non-uniform director field of the liquid crystal. The micro-structures are a backbone that restores the liquid crystal director field that existed during the polymerization process even when other factors, such as electric field, temperature, or surface anchoring, do not favor this restoration. The polymer micro-structures can be used in optical devices, such as diffraction gratings and deflecting and beam steering devices, and in micro-mechanical and micro-fluidic devices.